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Developing Airmen for Integration into Air, Space, and Cyberspace

The New Aggressors

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REVITALIZATION OF THE aggressor program provides expanded training opportunities in the air, space, and cyber realms. The following discussion details basic principles of the aggressor program, developed over time by organizations whose express objective has been to expose weaknesses in current systems and tactics in order to improve them. The article then looks to the future as the aggressor program integrates space and cyber capabilities into its existing activities involving air and air defense.

With the current pace of operations, training for the full spectrum of conflict has in large part given way to the need to focus on today's battle—as it should. High-end training opportunities are limited for any number of reasons, but at some point in the future, we will likely need to employ in major combat operations, bringing to bear technological advantages the United States has developed and maintained over the years. But the US Air Force cannot attribute its success during the last 61 years only to superior technology; in

fact, we can blame dependence on technology during the Vietnam War for higher-than-expected attrition in the air. Rather, the way the Air Force employs technology has enabled the service to stay ahead of its adversaries. Effective, realistic training prepares Airmen to use their weapons systems in expected roles and missions; it also prepares them to deal with the unexpected. Such training teaches them not what to think, but how to think, react, improvise, adapt, and overcome.

The opposing force (OPFOR or “Red”), “the stone upon which the Air Force hones its combat skills,” constitutes a key component of realistic, meaningful training.¹ If the OPFOR presents an outdated, unrealistic, or otherwise nonrepresentative threat, then Airmen learn the wrong lessons or don't learn at all. Giulio Douhet's observation that “victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur” may be true, but beyond solid preparation, one must also be able to deal with the unexpected.² A valid OPFOR assesses the present and looks to

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the future to anticipate and replicate the next threat, and it does so independently of the mainstream or “Blue” forces. In doing so, it both prepares Blue for what’s coming next and develops tactical flexibility as Blue forces, executing established tactics, techniques, and procedures (TTP), learn to adapt them to the unique problem presented. Foundational tactical training has to develop a baseline from which we can adapt, improvise, and overcome. The reinvigorated Air Force aggressor program, dedicated to analyzing and presenting current and emerging adversary systems and tactics, offers tactical problems that reinforce baseline training as well as develop flexibility and stimulate thought.

The aggressor program has provided combat air forces (CAF) this high-end training for the last 36 years. The program stood up in 1972 during the final phase of the Vietnam War, when the vaunted technological and tactical superiority of American fighters and pilots netted a depressing 2.4:1 kill ratio, decreasing at one point to parity as F-4 Phantoms and F-105 Thuds traded shots with Communist MiG-19 Farmers and MiG-21 Fishbeds.³ Although we now accept the OPFOR as a means of providing positive training, in 1972 the concept of dedicating units exclusively to studying/teaching enemy tactics in jets similar to MiGs was fraught with risk—at a time when risk mitigation was the watchword. To fly dissimilar air combat training was to invite disaster. CAF leadership held that pilots who had trained exclusively against their own fighter types would dangerously mishandle faster or more agile adversary aircraft, resulting in loss of control or midair collision—bent metal and dead aircrews.⁴ Today, the benefits of this sort of training are a given; dissimilar air combat training is necessary to prepare aircrews to fight the ultimate in dissimilar aircraft: those of real-world adversaries.

Initially, aggressors’ offers to travel to a host base to fly and teach elicited a tepid response: “At the time accident rates in the tactical air forces were high. ‘Wing commanders were scared to have us come.’”⁵ “A bunch of guys [from] Nellis” not only would drive up accident rates even higher but also would invite

greater scrutiny. If a unit performed poorly, its leaders feared that the aggressors would keep track and report their findings up the chain of command. But in 1973, the F-4 training unit at Homestead AFB, Florida, agreed to host the new 64th Aggressor Squadron’s (AGRS) pilots and their T-38s, aircraft that approximated MiG-21s in size and maneuverability.⁶ The first “Aggressor Road Show” sought to present a realistic replication of MiG capabilities and tactics observed in Vietnam, tailoring it to the audience and thus enabling student as well as instructor F-4 crews at Homestead to learn from trial and error, minus the threat of real missiles and bullets. Thirty-five years later, fighter wings are eager to have the aggressors visit—in some ways, tactical execution becomes simpler when crews fight dissimilar platforms (because fighting against similar aircraft complicates the beyond-visual-range and within-visual-range identification process). Aggressor training also brings with it the element of the unknown, which challenges and hones an aircrew’s adaptability.

Valid Training?

Eleven years after the Homestead AFB road show, Maj Gen Eugene Fischer, commander of the Air Force Tactical Fighter Weapons Center at Nellis AFB, Nevada, assembled all of the 64th and 65th AGRS pilots, berating them for the unprofessional behavior of a number of the flyers.⁷ The aggressor Class A (loss of life, loss of aircraft, or damage in excess of \$1 million) accident rate had skyrocketed in 1984 to 22.9 events per 100,000 hours of flying; between them, the 64th and 65th had crashed five F-5 aircraft in a year’s time. Without the aggressors, Tactical Air Command’s (TAC) accident rate was 1.9, roughly the same as today’s.⁸ The establishment’s worst fears had been realized—instead of making the Air Force stronger, the program was actually decreasing the service’s capability. Mechanical malfunction accounted for only one of a spate of accidents; the others resulted from pilot error. The aggressors prided themselves in selecting the best stick-and-rudder pilots available, so the

accidents weren't due to a lack of pilot skill. Instead, General Fischer focused on the pilots' motivation, narrowing the problem to attitude—the development of an egocentric “win at all costs” approach to the aggressor mission. Despite existing for the sole purpose of providing high-fidelity training to operational flying units, the aggressors had developed a reputation as “cowboys” who bent or broke rules in the name of teaching aircrews by “punishing errors.” On the one hand, their charter called for presenting an adversary tough enough to challenge the Blue force and improve its tactical skills. However, one could always find intelligence to rationalize this “Nellis freestyle” approach to adversary support, one that contributed to the win-at-all-costs mindset.⁹ On the other hand, although the aggressors presented a challenging threat, it had grown increasingly unrealistic—the desired end state had become defeating Blue, not making Blue better.¹⁰

In 1990 the aggressor program found itself in trouble once again, this time due to shrinking budgets. During the post-Cold War budget-prioritization debate, fiscal pressures overcame the value of the program. Because the aggressors could not provide adversary support to all fighter units at once, wings continued to train internally, using their own aircraft and pilots to simulate the threat. This practice continues today: tactics manuals give guidance on how to replicate adversary aircraft, weapons, and tactics, but operational aircrews who support Blue training as Red Air do so to the detriment of their own Blue skills. Consequently, Air Combat Command (the follow-on to TAC) limits the number of Red Air sorties aircrews can use as credit toward annual training requirements.¹¹ As Blue equipment and missions become increasingly complex, pilots find it more difficult to invest the time required to learn and properly execute emerging adversary tactics. However, from a purely programmatic perspective, it costs less to add sorties to existing flying-hour programs for operational units to use as Red Air than to stand up and support dedicated adversary squadrons.¹² With this in mind, the Air Force closed F-5 aggressor units in Pacific Air Forces

and US Air Forces in Europe (the 26th and 527th AGRS, respectively) as well as the 65th AGRS at Nellis. The 64th AGRS was drawn down to a flight-sized unit with six authorized F-16s and 10 pilots and then subsumed by the 414th Combat Training Squadron (Red Flag).¹³ This professional core unit would train aircrews on temporary assignment to Nellis to augment the Red Air presentation during Red Flag exercises and USAF Weapons School support. Although this arrangement permitted a numerically challenging threat picture, the part-time aggressors did not have the same grounding in tactics as did the professionals, so in the end, the value of training decreased.

In 2003 Gen T. Michael Moseley, vice-chief of staff at the time, reinvigorated the aggressor program at Nellis, renewing the 64th AGRS and initially expanding it to a primary aircraft authorization (PAA) of 12 F-16s (eventually increasing to 24 in 2009).¹⁴ In 2006 he reconstituted the 65th AGRS, this time in F-15C Eagles with upgraded radars and avionics. Whereas in the past, the aggressor program simulated the threat with older, less-capable Air Force fighters to reduce costs, upgraded F-15s enabled the squadron to accurately replicate fourth-generation fighters of the former Soviet Union. Flying-unit deactivations made the F-15s available, and experience gained from training against the former Soviet Union's modern fighters, flown by countries such as Germany, Malaysia, and India, drove home the reality that we cannot ignore near-peer air forces—that aggressor replication needs to include the most dangerous potential opponents. In many ways, the 65th AGRS's F-15s are technologically more capable than some operational Eagle squadrons.

At the same time, the aggressor program expanded to bring all air and air defense (for brevity this article refers to both as “air”), space, and cyberspace aggressor activities under one roof as part of the 57th Adversary Tactics Group (ATG), which includes the 547th Intelligence Squadron, thus continuing the hand-in-glove relationship between aggressors and intelligence. Likewise, every other squadron in the ATG includes intelligence personnel who help focus the collection of information

and conduct research. An important element of the aggressor program is the close relationship between operations and intelligence—all aggressor operators are schooled in intelligence capabilities and limitations, spending a significant amount of time studying the adversary.¹⁵ With continuous exposure to operations, intelligence officers and enlisted members acquire a much better appreciation for the efforts they support than they get elsewhere. Since its inception, the aggressor program has capitalized on integrating otherwise separate disciplines.

The ATG continues in this mold today; part of its charter involves integrating all aggressor activity in the air/space/cyber domains under one centralized, independent organization in order to present the most threat-representative adversary possible. Doing so will enable the ATG to present a coherent, realistic air/space/cyber picture of the adversary. An active, professional aggressor program allows operational units to concentrate on honing their tactics without the additional burden of deploying to Nellis to provide adversary support to the Weapons School and Red Flag. The ATG concept enables high-quality, accurate, and predictive threat training. It also has the potential to pay for itself as it assumes responsibility for all adversary support for the Weapons School, the 422nd Test and Evaluation Squadron (TES), and Red Flag at Nellis, saving combat-coded units from having to deploy there to provide such support.

With noted exceptions, the aggressor program has demonstrated continued improvement for the last 36 years, expanding from its small-scale proficiency to today's ability to challenge more than 80 aircraft in a Red Flag scenario. Hard lessons, such as those learned in 1984, have become imprinted on the aggressor program and continue to have relevance in this most recent era of expansion. The following review of the three most important lessons from the past applies to the air, space, and cyber domains; keeping them in mind will help the program stay on track as it continues to grow and adapt.

Win-at-All-Costs Mentality

General Fischer delivered his severe critique of the program in 1984 as a reaction to a corrosive win-at-all-costs attitude that eventually led to the aggressors' losing sight of their primary purpose—to serve as a training aid for Blue. Having existed for nearly 12 years, the program enjoyed the luxury of hand-selecting highly experienced and capable pilots—an essential level of expertise. If it seemed difficult to execute Blue tactics in modern aircraft, it proved doubly so to replicate Red tactics in significantly less capable T-38s and F-5s. In hindsight, this combination of substandard aircraft, restrictive tactics, and pilots selected for their outstanding flying records (individuals used to winning) led to an egocentric attitude. Dying for a living goes against everything that combat aircrews learn in training—from the very start in defensive basic fighter maneuvers, pilots are told to “never give up.” Even the most mature aggressors still react viscerally when referred to as “dead” in an exercise.

Preventing aggressors from slipping back into the win-at-all-costs mentality takes careful selection, strong squadron leadership, and continual emphasis that “we’re here to train Blue—if Blue wins, we all win.” It also requires a high level of maturity to find satisfaction in acting as a combat-training aid. Ed Clemons, charter member of the 64th AGRS, put it this way: “The best possible feeling for an aggressor was to come back from a flight out of breath, tired, and sweaty, knowing he used every tactic, employed every advantage he knows, and still did not come away with a ‘kill.’ ”¹⁶ The current ATG selection process allows the group's leadership to handpick the best qualified people from the pool of CAF instructor pilots and experienced four-ship flight leads during each assignment phase, in an effort to find pilots with the right balance of skill and maturity.

Based at Nellis AFB, the aggressors are surrounded by Weapons School instructors, weapons upgrade pilots, and operational test pilots from the 422nd TES. The pressure to measure up is significant—continuously losing training engagements has the potential to leave aggressors looking for opportunities to demonstrate

their own skills that set them apart from their peers in the selection process. Left unchecked, this understandable but unacceptable attitude can lead to unprofessional execution and increased risk, as occurred in 1984. When aggressors are allowed to feed their egos, bad things happen. Prevention starts with the selection process—stick-and-rudder skills are important, but a mature attitude is mandatory.

Squadron leadership offers the second antidote to the win-at-all-costs mentality. Supervisors can identify deviations very early in the process of an aggressor's loss of focus. The key entails actively soliciting feedback from those who use the aggressors as training aids. Violations of training rules should always merit attention during debriefs. Even if Red flight members don't report violations to their supervisors, these events are not quickly forgotten by Blue. AGRS supervisors need to develop and sustain a relationship with their Weapons School, 422nd TES, and Red Flag peers to maintain awareness of pilot performance and then follow up on violations. As the self-professed "keepers of the training rules," leaders must address any violation. Failure to do so allows squadron members to start down a slippery slide toward unprofessional behavior.

Finally, aggressors need constant reminding that, regardless of whether they win or lose, they win. If they design and execute realistic adversary replication perfectly and if Blue fails to manage the problem appropriately, then the aggressor pilots can employ weapons and kill Blue assets. The experience will burn the lesson into the Blue pilots' psyche as they make the long, lonely dead-man's journey back to Nellis. During debriefing, the threat expert then has the opportunity to explain the origins of the tactic and the weakness it sought to exploit. Blue pilots win when they internalize the painful lesson, and Red forces enjoy the satisfaction of executing their tactics properly and winning.

Happily, this scenario has become increasingly rare, yet Red still wins even when Blue wins. Keeping in mind that the aggressor's mission is to make Blue better, Red derives satisfaction from executing that mission properly and cheering Blue on as it solves the problem

presented. But this requires a constant mantra of "when Blue wins, we win; when Blue wins, we win" as the aggressor is "killed" and returns to the regeneration airfield to do it all again. By selecting skilled, mature pilots; by keeping a close eye on training-rule infractions; and by continually reminding pilots that in this business getting beaten is a good thing, we can assure that aggressors avoid the win-at-all-costs trap.

This process applies to space and cyber aggressors as well. Both domains are still working through the execution of tactics in an unopposed setting; we must closely tie adversary involvement to distinct objectives associated with known vulnerabilities. Just as the first aggressor road show to Homestead AFB saw Red significantly altering tactical replication to meet student training objectives, so must we limit and focus aggressor activity in the growing worlds of space and cyber. At best, "win at all costs" in these nascent disciplines will prove counterproductive; at worst, it could set fledgling efforts such as network operations back markedly.

Ossified/Unrealistic Tactics

Even if aggressor squadrons use only the most qualified pilots with perfect attitudes, ossified, rigid Red replication and unrealistic tactics can also detract from their ability to prepare Blue for the next battle. By far the most difficult aspect of the professional adversary mission is keeping up with the development of adversary tactics. Whereas enemy systems improve over time, technology is limited by physics and cost; by leveraging intelligence collection and current scientific knowledge, the ATG's threat-assessment processes have proven able to accurately assess how far a given technology can advance in the next five to eight years.¹⁷ Armed with this knowledge, aggressors can modify systems/weapons/airframe employment to replicate adversary technology with a high degree of fidelity. With higher-echelon support, the ATG has enjoyed considerable success in acquiring threat-representative equipment.

Tactical replication presents a very different problem since the development of tactics is limited only by the imagination. How an adversary chooses to employ his technology var-

ies widely across nations/cultures. Highly hierarchical cultures typically dictate tactics to aircrews through rigid command and control architectures. More liberal cultures tend to delegate tactical decision making to lower levels, allowing more flexible, responsive execution. Tactics have infinite possibilities; that is, even closely linked allies who operate similar systems—referencing the same tactical doctrine—develop and execute noticeably different tactics.¹⁸ One can imagine the difficulty in observing and documenting these tactics in insular, closed societies. When charged with “accurate threat replication,” the aggressors face a dilemma: is it possible to know how an adversary is going to react in combat? And even if they do manage to find a source for this data, with so many potential adversaries, which do they replicate? Aggressors seek to design tactics that resemble those observed in real/potential adversaries, but this is an imperfect science at best.

Accurate threat replication therefore requires constant study and adjustment to prevent tactics from becoming rigid and dogmatic. It also demands that pilots understand the culture they seek to replicate, an endeavor that has recently received additional emphasis.¹⁹ The “Aggressor Threat Replication Guide” delineates tactics that duplicate observed Soviet tactical behavior as well as postulated country-specific modifications, based on intelligence and the impact of improved systems capabilities (active missiles, improved radars, data links, etc.). The simplicity of the bipolar world allowed the United States to focus on Soviet tactics; today the problem set has grown significantly.

Taken to the extreme, this situation argues for nearly infinite tactical possibilities, depending on culture, weapons systems, and scenario. For the aggressors, replication means little if it does not serve to prepare Blue for a wide array of potential combat scenarios; oftentimes, however, completely realistic replication takes a backseat to part-task training, which produces yet another variable—Blue training objectives. Three units at Nellis AFB illustrate this well. In order to develop the most effective Air Force systems and tactics, the 422nd TES requires pristine threat systems

and tactics replication. Blue systems vulnerabilities identified during test and evaluation are remedied before the fielding of radars, jammers, and weapons in operational units. The 422nd also requires the most representative Red tactics the aggressors can muster as it assesses the effectiveness of new Blue systems and tactics.

The opposite is true of the Weapons School, where attaining accurate threat replication is less important than achieving “Desired Learning Objectives,” also the title of a graduate-level course. In this course, replication requirements vary as mission complexity grows from one-versus-one aircraft maneuvering to multi-formation package operations. Weapons School instructor pilots frequently request nonrepresentative formations/execution, seeking to test upgrading students’ situational awareness and comprehension of Blue tactics.

On the “replication versus training” spectrum, the Red Flag audience lies somewhere between the 422nd TES and the Weapons School. On the one hand, Red Flag scenarios demand accurate threat replication to validate the execution of large force-employment packages, but that must be tempered by the requirement to train not only the air-to-air escort aircraft on the leading edge of the package but also the bomb droppers following 30 miles behind them. Perfect replication would result in training for only a few flights in the package, while perfect training would overwhelm the mission commander’s plans, resulting in mission failure. During Red Flag, adversary tactics are adjusted to both validate Blue tactical execution and provide training to as many participants as possible.

All this is to say that aggressors walk a fine line between falling back on known, comfortable 1980s Soviet tactics and starting down the slippery slide of Nellis freestyle, designing tactics that initially challenge Blue but eventually become unsolvable, hindering valid training. Aggressor tactics need to be finite but adaptable, threat representative but challenging, and culturally informed. That’s a tall order. By actively soliciting feedback from Blue, aggressors can ensure that presentations meet training and/or replication requirements. Although

Blue may debate a new tactic's viability (especially if it works), an ongoing dialogue will serve to explain the thought process behind the tactic and guarantee that threat presentation meets the training need. The tactic has to be anchored in reality, but it can't become so rigid as to stifle Blue's learning. Ideally, aggressor tactics will always drive Blue forces to deal with a slightly different problem, keeping them flexible and improving their ability to adapt to new situations.

Because of their constant engagement in real-world operations, the space and cyber realms are far less susceptible to the problem of ossified aggressor tactics. Additionally, adversary capabilities and intent in these domains remain largely unknown. No one could possibly misinterpret enemy fighters attacking friendly aircraft and territory, but in the world of space operations, blue-on-blue interference and adversary jamming are often indistinguishable. This goes double for network operations; the spectrum of possible adversaries ranges from teenage hackers to nation-states, each employing different tactics. However, as aggressor programs for space and information mature, they too will develop workable tactics and must stay mindful of the need to continually challenge Blue's flexibility.

Failure to Show Value

An environment characterized by shrinking resources threatens any activity that appears to be underperforming, whether it's a new system or an established organization. Underperformance comes in many forms, some perceived, some real, but when the time comes to prioritize a program during resource allocation, both hard facts and perceptions about it are weighed against those of other programs. A line is drawn, and those activities that don't make the cut don't get fully resourced. Because aggressor contributions are difficult to quantify (about the only hard fact available is travel costs saved by no longer having to deploy units to Nellis to support Weapons School, test, and Red Flag adversary support—about \$7 million in 2007), the aggressor program stays at risk.²⁰ Currently a high priority, the

ATG program has adequate resources and has provided tangible benefit to operational units. September 2007 saw the first AGRS road shows in seven years (the 64th AGRS to Eglin AFB, Florida, and the 65th AGRS and 507th Air Defense Aggressor Squadron to Shaw AFB, South Carolina). The 33rd and 20th Fighter Wings warmly received these units, which provided dedicated adversaries and boosted threat awareness through detailed academics covering current and emerging threats. Having a unit offer dedicated professional dissimilar adversary support with well-studied tactics and specialized equipment (i.e., electronic jammers) takes an enormous burden off operational squadrons, but the impact is difficult to quantify in fiscal terms.

With the potential of overpromising and underdelivering adversary support, the ATG must manage expectations. Still in the growth phase, it will reach full capability in 2011. In the interim, the danger lies in raising expectations without enough people or equipment to satisfy them. Once the 64th and 65th AGRS reach 24 PAAs each and the 18th AGRS at Eielson AFB, Alaska, completes its conversion to 18 PAAs (Block 30 F-16s), sufficient capability will exist to cover all adversary requirements at Nellis, as well as to visit every fighter unit in the continental United States, Pacific Air Forces, and US Air Forces in Europe once a year for two weeks (including formal training units at Tyndall AFB, Florida, and Luke AFB, Arizona).²¹ Additionally, the 527th and 26th Space Aggressor Squadrons will be able to support satellite communications (SATCOM) jamming for Air Force Space Command's operational, test, and training requirements, as well as make training available in jamming the global positioning system (GPS) to flying and other units, mostly during Flag exercises. They will also provide support during road shows. Finally, the 57th and 177th Information Aggressor Squadrons will offer training in network attack and defense to Air Force Cyber Command network operators, with the potential to continue the current effort to educate individual users through focused network-vulnerability road shows at the base level.

The aggressor program will soon claim an operational wing's complement of combat-capable aircraft, an air defense aggressor squadron, two squadrons of space aggressors (with GPS and SATCOM jammers), and two information aggressor squadrons—quite a bill to pay for specialized training. Because it is a new initiative, the ATG enjoys the benefit of the doubt during the stand-up phase. Over time, should it fail to continuously demonstrate value for the investment, the group could again face the same programmatic axe it did in 1990.

Looking Ahead: Integration and Operational-Level Support

Because the Air Force moved all air/space/cyber training under the ATG program, the benefits of flying-aggressor lessons over the years have been actively integrated into the activities of space and cyber aggressor squadrons. Interestingly, the 1970s-style “safety first” training mentality that made the first aggressor road show so unpalatable to TAC units is apparent in space training today. Mistakes made during past training events received high-level scrutiny—the fixes have had the effect of making realistic training too hard to do. This situation resembles the one that existed as the Air Force (and Navy) conducted operations in Vietnam. That is, the services considered dissimilar training too dangerous to practice in peacetime; the impact on wartime performance is a matter of record. The aggressor experience highlights the need for more frequent and realistic live training, not less. Unfortunate mistakes occurred early in the flying-aggressor program (resulting in the “Cancer of TAC” speech of 1984, previously mentioned), but the overall effect over time has been to reduce accidents and improve capability. Space aggressors have steadily advocated the delegation of SATCOM jamming authority down to levels low enough to allow timely, effective training. The more that units practice their expected wartime missions, the lower the probability of errors.

The fledgling aggressor effort for space and cyber has patterned itself after three de-

cades of flying-aggressor experience. This has proven a sound approach during the stand-up period, but as these disciplines mature, it becomes increasingly clear that each will develop its own unique attributes. Despite their differences, the ATG charter calls for presenting the “complete enemy target set” in various stages of integration. Depending on the scenario, air/space/cyber will sometimes act independently, sometimes in unison, leveraging each other's strengths to compound the problem for Blue. For example, in a recent exercise, Blue forces compromised key position and timing information on air packages through sloppy operations-security procedures. The info aggressors secured the sensitive data (the objective is to make US and coalition forces stronger, not more vulnerable) and then passed it to the air and air defense aggressors, who decimated the lead fighters in the package. It remains to be seen to what degree real and potential adversaries are developing the ability to integrate effects, but the ATG's mission involves anticipating changes in the character of war—integration of air/space/cyber effects is coming in some form.

A noteworthy feature of the ATG—its integration of air, space, and cyber disciplines at the squadron level—enables it to innovate and experiment without excessive coordination. Because of the organization's relatively small size (500 people), each discipline can learn extensively about the others. Air and air defense aggressors coordinate their tactics with the space aggressors' GPS jamming and, in the process, learn about other space endeavors; meanwhile, space aggressors gain valuable exposure to air operations, broadening them for follow-on assignments in their field. Although air, space, and cyber professionals tend to be stovepiped in the broader context of the Air Force and Department of Defense, the small size of the ATG encourages ongoing interaction at this level. Lessons from this interaction have yielded positive learning well beyond Nellis's gates.²² Additionally, even though air and space work independently and jointly in their fairly narrow aggressor realms, information operations appear to hold the key to all integration efforts in the age of information-

enabled warfare. Information aggressors have interacted with everyone in the group, making believers of them all. Once the ATG's individual air/space/cyber operators become fully aware of the capabilities of the other domains, the results will be impressive.

Before becoming an aggressor, one must obtain an "instructor pilot" level of expertise in a particular realm. Although aggressors spend most of their time studying, teaching, and replicating adversary systems and tactics, they also rely heavily on their Blue experience to know which adversary capabilities will provide the most realistic training. This depth of experience is shared across domains in courses such as Aggressor 101 (Introduction to Adversary Tactics—a broad look at the entire aggressor program, taught at Nellis and required of all ATG members) and follow-on training, such as AGRS 202, 303, and so forth. Squadron commanders should be able to give each other's mission briefs, an effort to keep aggressor leaders mindful of their role in presenting the greater enemy target set.

Although the ATG effort will be self-limiting in order to replicate observed and realistic near-term adversary capabilities, growing integration will certainly produce lessons that can accrue to broader cross-domain efforts in the Air Force. Again, ATG members' firsthand experience operating in the air, space, and cyber domains will enable them to better understand how these can combine to challenge Blue with likely future scenarios in various exercise and experimentation venues (Virtual Flag, for instance). Just as importantly, the experience will also inevitably reveal strengths and weaknesses associated with increasing integration. The ATG will capture and transmit these lessons through mechanisms such as tactics conferences and USAF Warfare Center publications for greater Air Force use outside the ATG.

Beyond the integration of tactical-level effects exists the possibility of moving this training to the operational level. Aggressor squadrons specialize in creating tactical effects that have already seen use in operational-level exercises such as Virtual Flag to provide realistic and at times unexpected adversary scenarios. Although

it might be possible to use the ATG's combined knowledge of adversary capabilities and intentions to effectively train operational-level organizations such as air operations centers and air support operations centers, this would cross into the realm of "red teaming"—clearly not in the ATG charter.²³ However, the ATG could coordinate with organizations that already do red teaming (e.g., the Air Force Research Laboratory and the Agency for Defense Analysis) to make training at the operational level of war as realistic and meaningful as possible.

Conclusion

Today's expanding Air Force aggressor program is built on 36 years of valuable, sometimes painful, experience that will advise the development of integrated air, space, and cyber training. Not every lesson from the past will apply to space and cyber aggressors, but hard-learned, universal aggressor "laws" do exist. Allowing aggressors to slip into a win-at-all-costs mentality, failing to keep up with recent developments and settling into comfortable but ossified tactics, or forgetting the wider Air Force/joint audience and thereby failing to show value would quickly undermine the program. Current ATG TTPs include a multitude of other lessons: pitfalls such as taking on an assessment role (one of the factors that made the first aggressor road show undesirable), attempting to teach Blue forces their own tactics, or developing exceedingly difficult tactics that replicate a threat which doesn't exist.²⁴ These apply not only to the flying program but also to all aggressor domains. Yet, the space and cyber aggressors will develop their own domain-unique lessons that they will need to incorporate into their own TTPs and then share with the other domains to ensure that integration doesn't create problems.

The primary ATG focus in this regard entails maintaining a spirit of continuing evolution, driven by ever-increasing knowledge of the adversary's technology and tactics. Closely linked to Air Force and national intelligence activities, members of the ATG take pride in their ability to "know, teach, and replicate"

the adversary as one of only a few Air Force organizations specializing in breaking down barriers between operations and intelligence. This culture of continuous revalidation (the “know” of “know, teach, replicate”) makes the program well suited to taking the next step in high-fidelity training—integrating, expanding, and increasingly overlapping air, space, and cyber capabilities. Whether aggressors provide a two-ship formation of Red Air for supporting upgrade training at Shaw AFB or combine air, space, and cyber effects to train a widely dispersed Virtual Flag audience, the focus remains on valid, realistic training to prepare the Air Force for future warfare.

In the end, the aggressors aren’t Red but a deep shade of Blue, gearing all their effort toward training Blue forces and making them better. Growing dependence on a shrinking CAF fleet as well as the metamorphosis of space and cyber from supporting to supported combat roles means that full-spectrum, integrated aggressor training will become increasingly important as time goes on. “Enemy air-to-air successes during the Vietnam conflict led to the establishment of the first Aggressors in 1972. It should not take another . . . Project RED BARON type-report, generated from US combat losses, to serve as the catalyst for Aggressor training advocacy in other domains.”²⁵ □

Notes

1. Brig Gen Steve Hoog to the author, note, 25 January 2008.

2. Giulio Douhet, *The Command of the Air*, trans. Dino Ferrari (1942; new imprint, Washington, DC: Office of Air Force History, 1983), 30.

3. Dr. Richard P. Hallion, “A Troubling Past: Air Force Fighter Acquisition since 1945,” *Airpower Journal* 4, no. 4 (Winter 1990): 4, <http://www.airpower.maxwell.af.mil/airchronicles/apj/apj90/win90/1win90.htm>; see also Maj Michael P. Donovan, “Full Circle? The Transformation of Dedicated Adversary Air Training in the USAF” (thesis, School of Advanced Airpower Studies, Maxwell AFB, AL, 1998), 10.

4. Gen Bruce K. Holloway, “Air Superiority in Tactical Air Warfare,” *Air University Review* 19, no. 3 (March–April 1968): 8–9, <http://www.airpower.maxwell.af.mil/airchronicles/aureview/1968/mar-apr/holloway.html>. Tactical training in the 1960s focused on Cold War nuclear employment; air superiority training took a backseat to flawless execution of the nuclear war plan. Furthermore, as Holloway says, this reluctance to train against realistic adversaries “was partly a reflection of concern for flying safety” (9). This “safety first” theme came up repeatedly during interviews with pilots of that era.

5. Reina Pennington, “Grounded: The Aggressor Squadrons,” *Air and Space*, March 1994, 28.

6. *Ibid.*

7. Maj Gen Eugene Fischer, “The Cancer of TAC” (speech, Nellis AFB, NV, 7 September 1984, transcript of an audio recording).

8. For comparison, the CAF’s 2007 Class A rate was 2.69, and 2006’s was 1.74 (as was 2005’s). “Flight Safety Statistics,” <http://afsafety.af.mil/stats/07fltstats.txt>. For Air Force-wide rates, see “USAF Flight Mishap History, CY47–FY06,” <http://afsafety.af.mil/sef/stats/USAF%20Flight%20Mishap%20History.pdf>.

9. “Nellis freestyle” refers to using one’s knowledge of Blue forces’ capabilities and limitations to defeat them. Although replicating an adversary’s potential technology is a finite problem, replicating his tactics is a limitless challenge. An undisciplined AGRS program can claim that any tactic is valid (observed or postulated to be employed by known adversaries), but truly valid tactical replication depends on the strength of the group’s leadership and the proper attitude of its pilots.

10. To be completely fair, transition from the F-4 to the revolutionary F-15 contributed to this apparent departure from pure replication. Whereas unsophisticated F-5s could challenge F-4 crews with Soviet tactics, the vastly improved F-15 radar and fire-control systems made what were once challenging threat presentations easily solvable. The aggressors felt the need to challenge the incredibly capable F-15s with tactical problems to match. In some cases, this led to pilots flying their F-5s beyond the jets’ and the pilots’ capabilities, resulting in accidents. This situation bears watching today as the F-22 comes online and the aggressors seek to challenge this highly effective platform in order to prepare Raptor units for future combat.

11. This guidance is spelled out in Headquarters ACC/A3’s annual Ready Aircrew Program Tasking Message.

12. After the AGRS drawdown, a former aggressor said, “One way the Air Force is compensating for closing down the Aggressor squadrons is by having operational wings train against each other” (Pennington, “Grounded,” 36). Although training was less expensive, quality suffered as Blue units reluctantly assumed Red roles on a one-for-one basis. Donovan notes that “even when engaged in [dissimilar air combat training] with non-dedicated adversaries . . . practicing US versus US tactics leaves a dangerous gap in threat knowledge, and may prove to be negative training in the end” (“Full Circle?” 25).

13. Pennington, “Grounded,” 35.

14. "ATG Enabling Concept" (Washington, DC: Headquarters US Air Force, 2004).

15. Boots Boothby, original commander of the 64th AGRS, "remembers telling the commander of Tactical Air Command that there was 'a huge wall between operations and intelligence. And the reason it's there is because no fighter pilot was ever going to admit there was something he doesn't know'" (Pennington, "Grounded," 30). One cannot overstate the synergies that come from teaching flyers about intelligence (and vice versa).

16. Quoted in Pennington, "Grounded," 32.

17. The Emerging Threat Tactics Team (ET3) process has proven very useful in proactive threat assessment. By bringing intelligence professionals, operators, engineers, scientists, and think-tank researchers together, the ET3 has been able to assess observed adversary activity and then postulate where this technology might lead in five to eight years. By looking forward, the ET3 enables the acquisition and test communities to better prepare for the future.

18. For example, a Dutch exchange officer at Shaw AFB, SC, approached air combat maneuvers and air combat tactics differently than his American hosts. During air combat maneuvers, USAF pilots considered the aircraft that merged with the adversary to be the "engaged" fighter. The nonengaged fighter's job is to shoot missiles at the lone adversary but stay out of the fight in order to prevent midair collision between Blue fighters. Interestingly, the Dutch approach was to identify the nonmerged Blue fighter as engaged—the jet that merged with Red was to fight to stay alive while forcing the adversary to maneuver away from the engaged fighter, creating sufficient range to allow a quick kill. This puts the nonengaged fighter at a disadvantage since she or he is not allowed to fight in the most tactically efficient way. Instead, the nonengaged fighter trusts that the engaged pilot will quickly kill the adversary. These differences are attributable to variations in cultures and experiences; Dutch tactics were as effective as US tactics, yet they developed in a different culture with a different mind-set. If NATO allies execute differently, one can imagine the innumerable variations among potential adversaries from non-European cultures.

19. After returning from an exercise with another country, one aggressor pilot made the very astute observation that cultural/societal attitudes in this country would call for executing defensive counterair tactics very differently than the USAF's practice. In the American construct, the closer the threat to the point defended (home base, major city), the higher the acceptable risk level, to the point that a pilot will engage at a disadvantage, risking being shot down. The value of the defended target is greater than that of the pilot or the aircraft. Because they occupied a relatively high place in the social strata, host-nation pilots were more apt to continue to retreat until they established a tactical advantage, even if it meant putting the defended object at risk. The pilot and aircraft were considered more valuable than the defended people/places.

20. Air Combat Command/A3J, telephone conversation with the author, September 2006. According to the Weapons School commandant, the budget for traveling adversary support was \$14 million in fiscal year 2007. ATG priorities for supporting Nellis training are Red Flag first,

and then the Weapons School, and then test. In 2007 the 64th and 65th AGRS supported all Red Flag adversary requirements and roughly 30 percent of Weapons School requirements.

21. With 48 PAAs at Nellis, the ATG will be able to fly approximately 9,400 sorties per year. The Weapons School requires 5,300 sorties, whereas Red Flag needs 1,140 (12 sorties per vulnerability period), 1,440 for 12 road shows, and 400 to support operational test and evaluation, totaling roughly 8,000. Sortie requirements for Eielson AFB remain to be determined.

22. The ET3 process demonstrates the utility of having small numbers of select representatives from each domain assemble to assess an emerging capability. Although the end product is not fully vetted, it is timely. ET3 reports have had remarkable impact on Air Force training in a very short period of time. This same "think tank" approach to ATG integration will provide lessons that will support Blue integration.

23. A red team is "an organizational element comprised of trained and educated members that provide an independent capability to fully explore alternatives in plans and operations in the context of the operational environment and from the perspective of adversaries and others." Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001 (as amended through 30 May 2008), 460, http://www.dtic.mil/doctrine/jel/new_pubs/jp1_02.pdf.

24. *Assessment*: There have been attempts in the past to have the aggressors support operational readiness inspections as adversary air. Although this sounds like a perfect fit on the surface, it is important for the ATG to stay out of the assessment role. If units are concerned that their performance in Red Flags / road shows will go on a scorecard and be sent up the chain of command, they won't focus on learning. Instead they'll stack the deck with their best to make sure they pass the test. *Teaching Tactics*: Because members of the initial aggressor cadre were hand selected for their superior tactical skill, they were encouraged to teach basic fighter maneuvers and air combat tactics to the units they visited. Today, the program still gets the most qualified operators, but because they focus exclusively on the threat, their familiarity with Blue tactics falls away quickly. Blue knowledge forms the basis for their understanding of the adversary; maintaining independence from Blue demands that they present the most relevant adversary tactics and let Blue figure out how to deal with them. *Presenting a Threat That Doesn't Exist*: At first blush, many adversaries appear to be much more capable than they really are. In their desire to prepare for the worst case and to challenge Blue to be better, aggressors have sometimes found intel that supports difficult, if not unsolvable, tactical presentations. It takes a good deal of judgment to know when scenarios/tactics are nonrepresentative.

25. Lt Col Paul Huffman, "Aggressor Transformation: Beyond the Flightline" (thesis, Air War College, Maxwell AFB, AL, 2007), 38, <https://research.au.af.mil/papers/ay2007/awc/Huffman.pdf>. Project Red Baron analyzed the reasons for the Air Force's air-to-air losses in Vietnam.